What is claimed is:

1. In a carrier recovery system in a digital demodulator, a frequency compensation method, comprising:

(i) at an input of a phase error detector, reducing, by a down-sampling factor, sampling of signals received from a phase derotator and a slicer from a symbol rate to a down-sampled rate;

(ii) detecting a carrier lock condition at the down-sampled rate;

(iii) determining outputs of a phase accumulator at the down-sampled rate;

(iv) extrapolating extrapolated outputs between successive determined outputs to generate addresses to a symbol rate look-up table; and

(v) looking up compensating frequency and phase compensation offsets for input to the phase derotator at the generated addresses.

2. The frequency compensation method of claim 1, further including determining the down-sampling factor such that a predetermined maximum allowable pipeline delay is not exceeded.

3. The frequency compensation method of claim 2, wherein determining the down-sampling factor is based on the symbol rate.

4. The frequency compensation method of claim 2, wherein determining the down-sampling factor is based on a data channel condition.

5. The frequency compensation method of claim 2, wherein determining the down-sampling factor is programmed by an air interface processor.

6. The frequency compensation method of claim 1, wherein extrapolating the extrapolated outputs includes determining a gradient of the phase accumulator outputs.

7.   The frequency compensation method of claim 1, wherein generating the addresses includes combining the phase accumulator outputs and the extrapolated outputs.

8.   The frequency compensation method of claim 7, wherein generating the addresses includes reformatting the combined phase accumulator outputs and extrapolated outputs.

9.   A carrier recovery system for a digital receiver, comprising:

a phase derotator for derotating a signal received from an equalizer;

a slicer, communicating with the phase derotator, for providing a quantized decision of the signal; and

a feedback loop having down-sampling means for reducing by a down-sampling factor, sampling of signals from the phase derotator and the slicer from a symbol rate to a down-sampled rate;

a phase error detector for detecting phase errors at the down-sampled rate;

a loop filter, a carrier acquisition control and carrier recovery lock detector for determining a carrier lock condition;

a phase accumulator for providing outputs at the down-sampled rate;

a look-up table address generation unit for extrapolating extrapolated outputs between the phase accumulator outputs to provide look-up table addresses at the symbol rate; and

a symbol rate look-up table for generating, by reference to the look-up table addresses, compensating frequency and phase compensation offsets for input to the phase derotator.

10.   The carrier recovery system of claim 9, wherein the down-sampling means includes means for determining the down-sampling factor such that a predetermined maximum allowable pipeline delay is not exceeded.

11.   The carrier recovery system of claim 10, including means for determining the down-sampling factor based on the symbol rate.

12.   The carrier recovery system of claim 10, including means for determining the down-sampling factor based on a data channel condition.

13.   The carrier recovery system of claim 10, wherein the means for determining the down-sampling factor is programmable.

14.   The carrier recovery system of claim 9, wherein the look-up table address generation unit includes a gradient computation unit for determining a gradient of the outputs of the phase accumulator.

15.   The carrier recovery system of claim 14, wherein the gradient computation unit includes means for combining the outputs of the phase accumualator and the extrapolated outputs.

16.   The carrier recovery system of claim 14, wherein the gradient computation unit includes means for reformatting the combined phase accumulator outputs and extrapolated outputs to provide the look-up table addresses.

17.   The carrier recovery system of claim 9, wherein the look-up table address generation unit includes a multiplexer unit for providing the look-up table addresses to the symbol rate look-up table.